MULTIMEDIA UNIVERSITY

STUDENT IDENTIFICATION NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2017/2018

BOM2064 – QUALITY AND OPERATIONS MANAGEMENT

(All sections / Groups)

02 MARCH 2018
9.00 a.m. - 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 7 pages with 4 Questions only.
2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.

QUESTION 1

a) Over the years, there have been significant changes to the way businesses manage their operations. Discuss any **THREE** (3) operational trends in business. (6 marks)

b) Amanda grows roses in her 100 by 100 foot garden. She then sells the crop at the local farmers' market. Six months ago, she was able to produce and sell 550 kilograms of roses. Last month, she tried a new fertilizer that promised a 50% increase in yield per square foot. She harvested 850 kilograms. Did the fertilizer live up to its promise? Explain. (7 marks)

c) Jackson owns and operates a chain of 12 vegetarian restaurants in northern Malaysia. Sales figures and profits for the stores are provided in the table below. Sales are given in millions of Ringgit Malaysia; profits are in hundreds of thousands of Ringgit. (Use 2 decimal places for the following calculations).

Store	Profits (RM '00,000)	Sales (RM '000,000)
1	14	6
2	11	3
3	15	5
4	16	5
5	24	15
6	28	18
7	22	17
8	21	12
9	26	15
10	43	20
11	34	14
12	9	5

i) Determine the linear regression equation for the data. (9 marks)

ii) What is the forecast of profit for a store with sales of RM24 million? (3 marks)

(TOTAL: 25 marks)

Continued ...

QUESTION 2

a) Product and service design affects nearly every functional area of an organization. Explain the **SEVEN** (7) activities of product and service design. (15 marks)

b) Explain **FIVE** (5) methods for generating ideas, which can be used for problem solving and/or process improvement. (10 marks)

(TOTAL: 25 marks)

QUESTION 3

a) Caffree Inc. is a producer of decaffeinated coffee (in bottles). Each bottle has an average net weight of 4 ounces. Every day, Mario, the operation manager randomly selects and weighs a sample of 4 and record the average and range (in ounces) for each sample, subsequently for 2 weeks. The data is given as in the following table:

Samples	Sample range (oz.)	Sample average (oz.)
Day 1	0.41	4.00
Day 2	0.55	4.16
Day 3	0.44	3.99
Day 4	0.48	4.00
Day 5	-	-
Day 6	0.56	4.17
Day 7	0.62	3.93
Day 8	0.54	3.98
Day 9	0.44	4.01
Day 10	-	-

Note: On Day 5 and Day 10, Mario attended training and did not take any samples.

Find the upper control limit (UCL) and lower control limit (LCL) for the range and average. (Use 2 decimal places for calculations). Is the process in control? Explain. (15 marks)

b) There are many challenges and key issues in effectively managing a supply chain. List any **FIVE** (5) elements of supply chain management and critically discuss the issues commonly faced for each of these elements. (10 marks)

(TOTAL: 25 marks)

Continued ...

QUESTION 4

a) The following details Aminah Laundrette Services' use of detergents for a particular week with a standard deviation of 5.06.

Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Detergents used (gallons)	15	20	24	21	30	22	30

The laundrette's service charter promises to deliver superior service by operating 7 days per week and to fulfil 92% of all cleaning requests placed within 4 days. Using 2 decimal places for all calculations:

i) Compute the reorder point. (5 marks)

ii) If the management decides to reorder at a fixed interval of every 45 days, which increases the lead time, what would be the new reorder point? (4 marks)

iii) Evaluate **TWO** (2) benefits and **TWO** (2) disadvantages of ordering at fixed intervals. (8 marks)

b) The Wellesley Printing Company, based in Penang, uses eighty reams of A3 papers every hour at one of its printing stations. The cycle time is about 45 minutes. If the management sets the maximum authorized inventory at 75 reams, what would be the allowed rate of inefficiency? (5 marks)

c) In your opinion, what is the ultimate goal of practicing lean operation systems? (3 marks)

(TOTAL: 25 marks)

Continued ...

RELEVANT EQUATIONS / FORMULAS

1) CL = $\overline{\overline{X}}$

UCL, LCL (X – bar) = $\overline{\overline{X}} \pm A_2 \overline{R}$

UCL (R) = $D_4 \overline{R}$

LCL (R) = $D_3 \overline{R}$

Table for X – bar & R Charts

No of Observation	A2	D3	D4
In sub group *n*			
2	1.88	0	3.27
3	1.02	0	2.57
4	0.73	0	2.28
5	0.58	0	2.11
6	0.48	0	2

2) UCL c = $\bar{c} + 3\sqrt{\bar{c}}$

LCL c = $\bar{c} - 3\sqrt{\bar{c}}$

3) $\bar{p}$ = Total No of Defective from All Samples/ (No of Samples X Sample Size)

$Sp = \sqrt{\bar{p}(1-\bar{p})/n}$

CL = $\bar{p}$

LCL = $\bar{p} - 3\,Sp$

UCL = $\bar{p} + 3\,Sp$

4) Capacity Utilization = Capacity Used / Best Operating Level

5) $$r = \frac{n\sum XY - [\sum X \sum Y]}{\sqrt{\left[n\sum X^2 - (\sum X)^2\right]\left[n\sum Y^2 - (\sum Y)^2\right]}}$$

$$a = \overline{Y} - b\overline{X}$$

$$b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - \left(\sum x\right)^2}$$

6) Exponential smoothing

Forecast for the month *t*: $F_t = F_{t-1} + \alpha(A_{t-1} - F_{t-1})$

Continued ...

7) Inventory Management:

$$\text{EOQ} = Q^* = \sqrt{\frac{2DS}{H}} \qquad TC = \frac{Q}{2}H + \frac{D}{Q}S$$

$$\text{EPQ} = Q_0 = \sqrt{\frac{2DS}{H}}\sqrt{\frac{p}{p-u}} \qquad I_{\max} = \frac{Q}{P}(p-u) \qquad TC = \frac{I_{\max}}{2}\text{H} + \frac{\text{D}}{\text{Q}}\text{S}$$

$$SS = z(\sigma_d)\sqrt{LT} \quad \text{ROP} = \bar{d}LT + z\sigma_d\sqrt{LT}$$

8) Lean Operations:

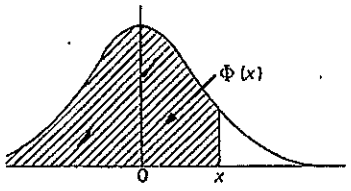
$$N = \frac{DT(1+X)}{C}$$

Continued ...

Z-TABLE

THE NORMAL DISTRIBUTION FUNCTION

The function tabulated is $\Phi(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x} e^{-\frac{1}{2}t^2}\, dt$. $\Phi(x)$ is the probability that a random variable, normally distributed with zero mean and unit variance, will be less than or equal to x. When $x < 0$ use $\Phi(x) = 1 - \Phi(-x)$, as the normal distribution with zero mean and unit variance is symmetric about zero.



x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$
0·00	0·5000	0·40	0·6554	0·80	0·7881	1·20	0·8849	1·60	0·9452	2·00	0·97725
·01	·5040	·41	·6591	·81	·7910	·21	·8869	·61	·9463	·01	·97778
·02	·5080	·42	·6628	·82	·7939	·22	·8888	·62	·9474	·02	·97831
·03	·5120	·43	·6664	·83	·7967	·23	·8907	·63	·9484	·03	·97882
·04	·5160	·44	·6700	·84	·7995	·24	·8925	·64	·9495	·04	·97932
0·05	0·5199	0·45	0·6736	0·85	0·8023	1·25	0·8944	1·65	0·9505	2·05	0·97982
·06	·5239	·46	·6772	·86	·8051	·26	·8962	·66	·9515	·06	·98030
·07	·5279	·47	·6808	·87	·8078	·27	·8980	·67	·9525	·07	·98077
·08	·5319	·48	·6844	·88	·8106	·28	·8997	·68	·9535	·08	·98124
·09	·5359	·49	·6879	·89	·8133	·29	·9015	·69	·9545	·09	·98169
0·10	0·5398	0·50	0·6915	0·90	0·8159	1·30	0·9032	1·70	0·9554	2·10	0·98214
·11	·5438	·51	·6950	·91	·8186	·31	·9049	·71	·9564	·11	·98257
·12	·5478	·52	·6985	·92	·8212	·32	·9066	·72	·9573	·12	·98300
·13	·5517	·53	·7019	·93	·8238	·33	·9082	·73	·9582	·13	·98341
·14	·5557	·54	·7054	·94	·8264	·34	·9099	·74	·9591	·14	·98382
0·15	0·5596	0·55	0·7088	0·95	0·8289	1·35	0·9115	1·75	0·9599	2·15	0·98422
·16	·5636	·56	·7123	·96	·8315	·36	·9131	·76	·9608	·16	·98461
·17	·5675	·57	·7157	·97	·8340	·37	·9147	·77	·9616	·17	·98500
·18	·5714	·58	·7190	·98	·8365	·38	·9162	·78	·9625	·18	·98537
·19	·5753	·59	·7224	·99	·8389	·39	·9177	·79	·9633	·19	·98574
0·20	0·5793	0·60	0·7257	1·00	0·8413	1·40	0·9192	1·80	0·9641	2·20	0·98610
·21	·5832	·61	·7291	·01	·8438	·41	·9207	·81	·9649	·21	·98645
·22	·5871	·62	·7324	·02	·8461	·42	·9222	·82	·9656	·22	·98679
·23	·5910	·63	·7357	·03	·8485	·43	·9236	·83	·9664	·23	·98713
·24	·5948	·64	·7389	·04	·8508	·44	·9251	·84	·9671	·24	·98745
0·25	0·5987	0·65	0·7422	1·05	0·8531	1·45	0·9265	1·85	0·9678	2·25	0·98778
·26	·6026	·66	·7454	·06	·8554	·46	·9279	·86	·9686	·26	·98809
·27	·6064	·67	·7486	·07	·8577	·47	·9292	·87	·9693	·27	·98840
·28	·6103	·68	·7517	·08	·8599	·48	·9306	·88	·9699	·28	·98870
·29	·6141	·69	·7549	·09	·8621	·49	·9319	·89	·9706	·29	·98899
0·30	0·6179	0·70	0·7580	1·10	0·8643	1·50	0·9332	1·90	0·9713	2·30	0·98928
·31	·6217	·71	·7611	·11	·8665	·51	·9345	·91	·9719	·31	·98956
·32	·6255	·72	·7642	·12	·8686	·52	·9357	·92	·9726	·32	·98983
·33	·6293	·73	·7673	·13	·8708	·53	·9370	·93	·9732	·33	·99010
·34	·6331	·74	·7704	·14	·8729	·54	·9382	·94	·9738	·34	·99036
0·35	0·6368	0·75	0·7734	1·15	0·8749	1·55	0·9394	1·95	0·9744	2·35	0·99061
·36	·6406	·76	·7764	·16	·8770	·56	·9406	·96	·9750	·36	·99086
·37	·6443	·77	·7794	·17	·8790	·57	·9418	·97	·9756	·37	·99111
·38	·6480	·78	·7823	·18	·8810	·58	·9429	·98	·9761	·38	·99134
·39	·6517	·79	·7852	·19	·8830	·59	·9441	·99	·9767	·39	·99158
0·40	0·6554	0·80	0·7881	1·20	0·8849	1·60	0·9452	2·00	0·9772	2·40	0·99180

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THE NORMAL DISTRIBUTION FUNCTION

x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$
2·40	0·99180	2·55	0·99461	2·70	0·99653	2·85	0·99781	3·00	0·99865	3·15	0·99918
·41	·99202	·56	·99477	·71	·99664	·86	·99788	·01	·99869	·16	·99921
·42	·99224	·57	·99492	·72	·99674	·87	·99795	·02	·99874	·17	·99924
·43	·99245	·58	·99506	·73	·99683	·88	·99801	·03	·99878	·18	·99926
·44	·99266	·59	·99520	·74	·99693	·89	·99807	·04	·99882	·19	·99929
2·45	0·99286	2·60	0·99534	2·75	0·99702	2·90	0·99813	3·05	0·99886	3·20	0·99931
·46	·99305	·61	·99547	·76	·99711	·91	·99819	·06	·99889	·21	·99934
·47	·99324	·62	·99560	·77	·99720	·92	·99825	·07	·99893	·22	·99936
·48	·99343	·63	·99573	·78	·99728	·93	·99831	·08	·99896	·23	·99938
·49	·99361	·64	·99585	·79	·99736	·94	·99836	·09	·99900	·24	·99940
2·50	0·99379	2·65	0·99598	2·80	0·99744	2·95	0·99841	3·10	0·99903	3·25	0·99942
·51	·99396	·66	·99609	·81	·99752	·96	·99846	·11	·99906	·26	·99944
·52	·99413	·67	·99621	·82	·99760	·97	·99851	·12	·99910	·27	·99946
·53	·99430	·68	·99632	·83	·99767	·98	·99856	·13	·99913	·28	·99948
·54	·99446	·69	·99643	·84	·99774	·99	·99861	·14	·99916	·29	·99950
2·55	0·99461	2·70	0·99653	2·85	0·99781	3·00	0·99865	3·15	0·99918	3·30	0·99952

The critical table below gives on the left the range of values of x for which $\Phi(x)$ takes the value on the right, correct to the last figure given; in critical cases, take the upper of the two values of $\Phi(x)$ indicated.

3·075	0·9990	3·263	0·9994	3·731	0·99990	3·916	0·99995
3·105	0·9991	3·320	0·9995	3·759	0·99991	3·976	0·99996
3·138	0·9992	3·389	0·9996	3·791	0·99992	4·055	0·99997
3·174	0·9993	3·480	0·9997	3·826	0·99993	4·173	0·99998
3·215	0·9994	3·615	0·9998	3·867	0·99994	4·417	0·99999
			0·9999		0·99995		1·00000

When $x > 3{\cdot}3$ the formula $1-\Phi(x) \doteqdot \frac{e^{-\frac{1}{2}x^2}}{x\sqrt{2\pi}}\left[1-\frac{1}{x^2}+\frac{3}{x^4}-\frac{15}{x^6}+\frac{105}{x^8}\right]$ is very accurate, with relative error less than $945/x^{10}$.

End of Paper